An experimental study in the origin of abnormal mitoses in tumours

Venema, Gerhardus

SUMMARY

1. Earlier and current theories of carcinogenesis are briefly surveyed.
2. The present study considers whether the commonly observed abnormal mitoses in tumour cells are caused by the presence of increased amounts of substances which are able to interfere with mitosis. The analysis was carried out by examining the effects of 8 tumour and normal tissue extracts on mitosis in root-tip meristems of *Allium cepa.*
3. From the effects analyzed, comprising stickyness of the chromosomes, abnormalities due to abnormal spindle function and chromosomal breakage, it was concluded that quantitative differences between the abnormality inducing capacity of tumour and normal tissue extracts exist.
4. Analysis of the effects on root-tip mitosis of 2 necrotic tissue extracts obtained from tumours revealed considerable abnormality inducing capacity. This evidence suggested that some of the abnormalities induced by tumour extracts may be caused by the presence of necrotic tissue substances. In addition it is likely that increased amounts of abnormality inducing substances are present in tumour cells as compared with normal cells.
5. Autolytic products, arising from necrotic tissues are envisaged as an external factor contributing to the mitotic and chromosomal instability of the tumour cells, whereas the increase of abnormality inducing substances in the tumour cells is regarded as due to changes in metabolism caused by an abnormal environment. These two factors, to which the mitotic and chromosomal instability is attributed, together with the abnormal environment are considered as factors establishing the stemline and may possibly account for some tumour properties such as high glycolytic activity and decrease or loss of enzymes involved in the functions of the differentiated cell.
6. Mitotic and chromosomal instability of tumour cells may there-

fore be considered as secondary phenomenona resulting from environmental changes during tumour growth. The results obtained and discussed on the basis of known studies do not support the theory of carcinogenesis involving abnormal mitosis or chromosomal changes, but are not inconsistent with any of the other theories surveyed in this work.